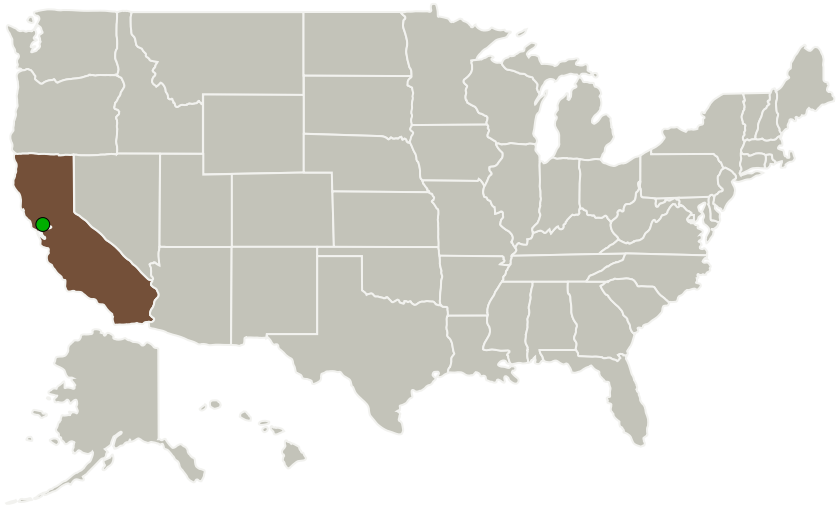
Short Pulsed Laser Methods for Velocimetry and Thermometry in High Enthalpy Facilities, Phase II

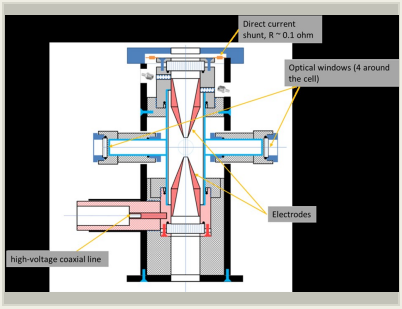
Completed Technology Project (2016 - 2019)

Project Introduction

A suite of pulsed laser diagnostics is proposed for studying aspects of planetary entry and Earth atmospheric reentry in arc jets. For example, dissociation of molecules impacts the flow-field physics, including surface heat flux and catalytic surface reactions. Results obtained during the Phase I effort point to three promising diagnostic techniques: Rayleigh Scattering Polarimetry (RSP) for dissociation fraction, Thermal Acoustic Wave (TAW) thermometry for gas temperature, and Radar Resonance Enhanced Multi-photon Ionization (Radar REMPI) for gas temperature and velocity. The RSP technique is based on the differences in the polarization of Rayleigh-scattered light between atoms and molecules. The TAW technique is based on the determination of wave speed from the propagation of an acoustic wave generated by a laser spark from the focused beam of a pulsed laser. In the case of Radar REMPI, temperature and velocity are obtained through the spectral broadening and frequency shift associated with two-photon resonance interactions in atomic oxygen and nitrogen.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
MetroLaser, Inc.	Lead Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB)	Laguna Hills, California
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations
California

Project Transitions

May 2016: Project Start

June 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139745)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

MetroLaser, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Jacob George

Co-Investigator:

Jacob George

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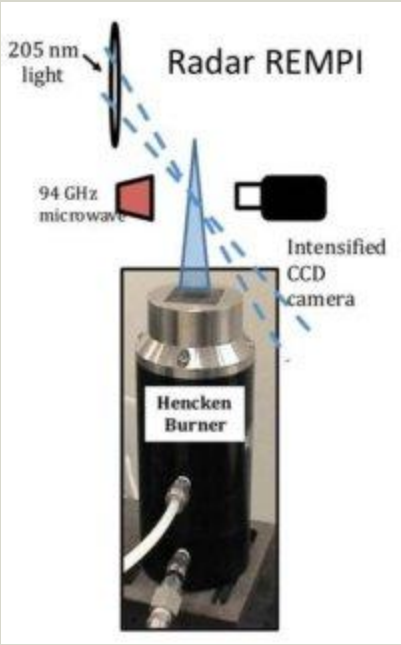
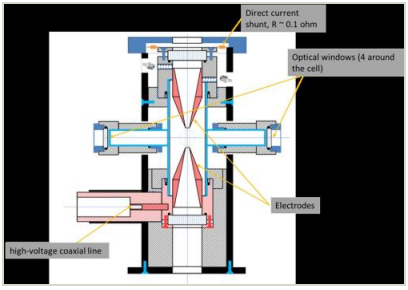
Images



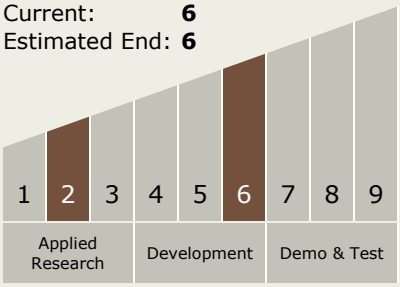
Briefing Chart Image
Short Pulsed Laser Methods for Velocimetry and Thermometry in High Enthalpy Facilities, Phase II
(https://techport.nasa.gov/image/129412)



Final Summary Chart Image
Short Pulsed Laser Methods for Velocimetry and Thermometry in High Enthalpy Facilities, Phase II
(https://techport.nasa.gov/image/131224)

Technology Maturity (TRL)

Start: **2**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.4 Vehicle Systems
    - TX09.4.5 Modeling and Simulation for EDL

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System